

IN THE CLAIMS

1. (currently amended) A transmitting apparatus, comprising:

a first transmitting unit operable to transmit a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated; and

a second transmitting unit operable to transmit a second signal component of ~~said the~~ quadrature modulated signal as a training signal, ~~said the~~ second signal component being orthogonal to ~~said the~~ first signal component, the first signal component being an in-phase signal component, and the second signal component being a quadrature signal component.

2. (canceled)

3. (currently amended) A transmitting apparatus, comprising:

a first transmitting unit operable to transmit a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated; and

a second transmitting unit operable to transmit a second signal component of the quadrature modulated signal as a training signal, the second signal component being orthogonal to the first signal component, as claimed in claim 1, wherein said the first signal component is being a quadrature signal component, and said the second signal component is being an in-phase signal component.

4. (currently amended) A transmitting apparatus as claimed in claim 1, wherein ~~said the~~ training signal is formed by a known data sequence generated on the basis of a predetermined clock.

5. (currently amended) A transmitting apparatus as claimed in claim 1, further comprising:

a training signal generating unit operable to generate ~~said the~~ training signal;

a transmission data generating unit operable to generate ~~said the~~ data desired to be transmitted; and

a quadrature modulation unit operable to subject a data signal based on ~~said the~~ data desired to be transmitted and ~~said the~~ training signal to quadrature modulation to form ~~said the~~ quadrature modulated signal.

6. (currently amended) A signal transmitting method, comprising:

transmitting a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated; and

transmitting a second signal component of the quadrature modulated signal orthogonal to the first signal component as a training signal, the first signal component being an in-phase signal component, and the second signal component being a quadrature signal component.

7. (currently amended) A receiving apparatus, comprising:

a receiving unit operable to receive a signal including first and second signal components of a quadrature modulated signal, ~~said the~~ first signal component including a signal in which data desired to be transmitted is modulated, and ~~said the~~ second signal component being orthogonal to ~~said the~~ first signal component and being transmitted as a training signal, the first signal component being an in-phase signal component, and the second signal component being a quadrature signal component; and

an equalizer operative to adaptively equalize ~~said the~~ first signal component using ~~said the~~ training signal.

8. (canceled)

9. (currently amended) A receiving apparatus, comprising:

a receiving unit operable to receive a signal including first and second signal components of a quadrature modulated signal, the first signal component including a signal in which data desired to be transmitted is modulated, and the second signal component being orthogonal to the first signal component and being transmitted as a training signal, as claimed in claim 7, wherein said the first signal component is being a quadrature signal component, and said the second signal component is being an in-phase signal component; and

an equalizer operative to adaptively equalize the first signal component using the training signal.

10. (currently amended) A receiving apparatus as claimed in claim 7, wherein ~~said the~~ training signal is formed by a known data sequence.

11. (currently amended) A receiving apparatus, comprising:

a receiving unit operable to receive a transmission signal including first and second signal components of a quadrature modulated signal, ~~said the~~ first signal component including a signal in which data desired to be transmitted is modulated, and ~~said the~~ second signal component being orthogonal to ~~said the~~ first signal component and being transmitted as a training signal;

a signal separator operable to separate ~~said the~~

transmission signal into a third signal component corresponding to ~~said~~ the first signal component and a fourth signal component orthogonal to ~~said~~ the third signal component and corresponding to ~~said~~ the second signal component;

an equalizer operable to equalize ~~said~~ the third signal component;

a signal generator operable to generate a known signal identical to the ~~said~~ training signal; and

a correlation unit operable to use the ~~said~~ third signal component, the ~~said~~ fourth signal component and the ~~said~~ known signal to obtain a ratio between a level of the ~~said~~ second signal component included in the ~~said~~ third signal component and a level of the ~~said~~ second signal component formed by a direct wave included in the ~~said~~ fourth signal component, a ratio between a level of the ~~said~~ second signal component formed by an indirect wave included in the ~~said~~ fourth signal component and the ~~said~~ level of the ~~said~~ second signal component formed by the ~~said~~ direct wave included in the ~~said~~ fourth signal component, a time difference between the ~~said~~ second signal component included in the ~~said~~ third signal component and the ~~said~~ known signal, and a time difference between the ~~said~~ second signal component formed by said direct wave included in the ~~said~~ fourth signal component and the ~~said~~ second signal component formed by the ~~said~~ indirect wave included in the ~~said~~ fourth signal component;

whereby equalizing characteristics of the ~~said~~ equalizer are adjusted on the basis of results obtained by the ~~said~~ correlation unit.

12. (currently amended) A signal receiving method, comprising:

receiving a signal including first and second signal components of a quadrature modulated signal, the first signal

component including a signal in which data desired to be transmitted is modulated, and the second signal component being orthogonal to the first signal component and being transmitted as a training signal, the first signal component being an in-phase signal component, and the second signal component being a quadrature signal component; and

adaptively equalizing the first signal component using the training signal.

13. (currently amended) A transmitting and receiving apparatus for transmitting and receiving a signal modulated by quadrature modulation, ~~said—the~~ transmitting and receiving apparatus comprising:

a transmitting unit operable to transmit a transmission signal including a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated, and a second signal component of said ~~quadrature—the~~ quadrature modulated signal as a training signal, ~~said—the~~ second signal component being orthogonal to ~~said—the~~ first signal component, the first signal component being an in-phase signal component, and the second signal component being a quadrature signal component; and

a receiving unit operable to receive ~~said—the~~ transmission signal and to adaptively equalize ~~said—the~~ first signal component using ~~said—the~~ training signal.

14. (canceled)

15. (currently amended) A transmitting and receiving apparatus for transmitting and receiving a signal modulated by quadrature modulation, the transmitting and receiving apparatus comprising:

a transmitting unit operable to transmit a

transmission signal including a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated, and a second signal component of the quadrature modulated signal as a training signal, the second signal component being orthogonal to the first signal component, as claimed in claim 13, wherein said the first signal component is being a quadrature signal component, and said the second signal component is being an in-phase signal component; and
a receiving unit operable to receive the transmission signal and to adaptively equalize the first signal component using the training signal.

16. (currently amended) A transmitting and receiving apparatus as claimed in claim 13, wherein ~~said the~~ training signal is formed by a known data sequence.

17. (currently amended) A transmitting and receiving apparatus as claimed in claim 13, wherein ~~said the~~ transmitting unit includes:

a training signal generating unit operable to generate ~~said the~~ training signal;

a transmission data generating unit operable to generate ~~said the~~ data desired to be transmitted;

a quadrature modulation unit operable to subject a data signal based on ~~said the~~ data desired to be transmitted and ~~said the~~ training signal to quadrature modulation to form ~~said the~~ quadrature modulated signal; and

a transmitter operable to transmit ~~said the~~ quadrature modulated signal.

18. (currently amended) A transmitting and receiving apparatus ~~as claimed in claim 17~~ for transmitting and receiving a signal modulated by quadrature modulation, thr transmitting

and receiving apparatus comprising:

a transmitting unit operable to transmit a transmission signal including a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated, and a second signal component of the quadrature modulated signal as a training signal, the second signal component being orthogonal to the first signal component;
and

a receiving unit operable to receive the transmission signal and to adaptively equalize the first signal component using the training signal, wherein

the transmitting unit includes:

a training signal generating unit operable to generate the training signal;

a transmission data generating unit operable to generate the data desired to be transmitted;

a quadrature modulation unit operable to subject a data signal based on the data desired to be transmitted and the training signal to quadrature modulation to form the quadrature modulated signal; and

a transmitter operable to transmit the quadrature modulated signal,

wherein ~~said the~~ receiving unit includes:

a signal separator operable to separate ~~said the~~ transmission signal into a third signal component corresponding to ~~said the~~ first signal component and a fourth signal component orthogonal to ~~said the~~ third signal component and corresponding to ~~said the~~ second signal component;

an equalizer operable to equalize ~~said the~~ third signal component;

a signal generator operable to generate a known signal identical to ~~said the~~ training signal; and

a correlation unit operable to use ~~said the~~ third

signal component, ~~said the~~ fourth signal component and ~~said the~~ known signal to obtain a ratio between a level of ~~said the~~ second signal component included in ~~said the~~ third signal component and a level of ~~said the~~ second signal component formed by a direct wave included in ~~said the~~ fourth signal component, a ratio between a level of ~~said the~~ second signal component formed by an indirect wave included in ~~the said~~ fourth signal component and ~~said the~~ level of ~~the said~~ second signal component formed by ~~the said~~ direct wave included in ~~the said~~ fourth signal component, a time difference between ~~said the~~ second signal component included in ~~said the~~ third signal component and ~~said the~~ known signal, and a time difference between ~~said the~~ second signal component formed by ~~said the~~ direct wave included in ~~the said~~ fourth signal component and ~~said the~~ second signal component formed by ~~said the~~ indirect wave included in ~~said the~~ fourth signal component;

whereby equalizing characteristics of ~~said the~~ equalizer are adjusted on the basis of results obtained by ~~said the~~ correlation unit.

19. (currently amended) A method for transmitting and receiving a signal modulated by quadrature modulation, ~~said the~~ method comprising:

transmitting a transmission signal including a first signal component of a quadrature modulated signal as a signal in which data desired to be transmitted is modulated and a second signal component of the quadrature modulated signal orthogonal to the first signal component as a training signal, the first signal component being an in-phase signal component, and the second signal component being a quadrature signal component; and

receiving the transmission signal and adaptively equalizing the first signal component using the training signal.